

knowledge is and remains throughout provisional.' But inasmuch as Weismann has undertaken to teach us 'just how the molecules behave,' and since this is the *only* aim of his essay, it would seem that all such clamorings are entitled to some recognition. Unless the food of determinants is 'Ein ganz besonderes Saft,' one would think that the soma might be able to supply it in quantities large enough to cause the hungry determinants and biophores to stop their fighting. In all seriousness, it seems to me that to class such a purely figurative and imaginary 'struggle' along with Darwin's principle, as Weismann does, is to wholly disregard the importance of evidence.

3. The greatest objection to the all-sufficiency of natural selection, which Weismann, along with many others, recognizes, is 'the fact of a simultaneous, functionally concordant yet essentially diversified modification of numerous parts.' This objection Weismann thinks he has removed by assuming that the determinants may vary simultaneously and independently, and may increase or decrease in size through germinal selection. This does remove some of the difficulties; it furnishes, *ex hypotheso*, the individual variations for personal selection, but the one great difficulty remains untouched, viz., the *combination* of these individual variations into a functionally concordant system. This difficulty, which is really the only important one in this connection, remains just where it was before Weismann proposed his doctrine of germinal selection.

Weismann ably argues that there is in certain quarters an evident tendency to under-estimate the relative importance of theories as compared with facts, and he points out the great value of having symbols or mental images of natural processes, even though these symbols may not correspond to reality. Whether there are any such things as biophores, determinant,

germinal selection and the like, or not, it is at least evident that a mental symbol is better than mental vacuity, and that to have conceived a process by which the details of evolution and inheritance can be explained, even if it be a false conception, is better than no conception at all. Prof. Weismann is right when he says that there is no just cause for criticism of his system on the ground that it is purely imaginary, *provided it is always so treated and understood*. It is only when he says that certain imaginary processes *must be so*, as he does in this as well as in former essays, that it is pertinent to remind him that we are dealing, not with a system of necessities, but only with a series of mental images, each one of which may or may not correspond to reality.

I think it may well be doubted whether such speculations are at present the most profitable method of approaching the problems under discussion. Induction and the test of conceivability are distinctly inferior as scientific instruments to observation, experiment and deduction. Speculation is valuable only as it is verified by observation and experiment and while the solution of such recondite problems must be approached from all possible sides, yet it may be doubted whether it is more profitable for one to continue to start more speculations than a whole generation can run down rather than to take part in hunting down and verifying or rejecting his own speculations.

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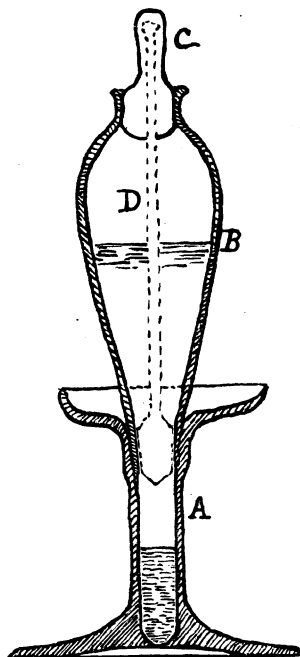
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THE SMEETH SEPARATING APPARATUS.

THE tube devised by Harada for using heavy liquids in separating the mineral constituents of rocks has been modified by Broegger, so as to obviate difficulties arising from the adherence of light and heavy particles desired to be separated. This ap-

paratus is more or less cumbersome and fragile on account of the stop-cocks it contains.

It appears to me that the separating tube proposed by Smeeth (Proceedings of the Royal Dublin Society, May, 1888, p. 58) has not been fully appreciated. The principle involved seems to be an excellent one, and by modifying the shape somewhat it can be much improved. With this end in view, several of the tubes were made by Eimer & Amend, of New York, after the design indicated in the accompanying figure. The apparatus consists of a cup-shaped base, A, with a hollow standard,



the tube B, to contain the heavy liquid in which the separation takes place, the stoppers C and D to close respectively the upper and lower ends of this tube. All of these separate parts have ground fittings, so as to be water-tight. The tube is so simple that no special explanation of the method of using it is needed. It will be seen that when the two stoppers, C and D, are out,

it affords an opportunity to stir both the material which has sunk to the bottom of the tube of the standard A, as well as that which floats upon the top of the heavy liquid in B, and by repeating the process several times it is possible to easily secure a complete separation.

It will be readily seen, also, that by inserting the stopper D, the tube B, with its contents of heavy liquid and light material floating on its top, can be removed. The heavy material can then be washed out of A, leaving this heavy material entirely separated in the standard A.

This apparatus, besides the advantage already enumerated, is especially stable and portable, and all the material during the separation is free from exposure to the air, features which give its great advantage in laboratory work.

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U. S. GEOLOGICAL SURVEY.

CURRENT NOTES ON PHYSIOGRAPHY.

VALLEYS OF THE OZARK PLATEAU.

THE account of the Ozark mountains recently published by Keyes (see *SCIENCE*, Feb. 21, 1896) is followed by a valuable essay from O. F. Hershey on the valleys of the same region (*Amer. Geol.*, xvi, 1895, 338-357); the conclusions of the two observers agreeing in general as to processes of land sculpture, but differing somewhat as to geological dates at which various stages of the work of denudation were reached. A lowland peneplain has been uplifted to form the Ozark plateau; it is deeply dissected around the margin, so that the dis-severed hills are not inappropriately called 'mountains.' The ancient lowland is called a Tertiary peneplain by Keyes, and a Jura-Cretaceous peneplain by Hershey. The latter describes certain broad and shallow valley-troughs, slightly depressed beneath the general upland, as the work of Tertiary time in the gently uplifted Cretaceous peneplain. He concludes that the meandering